

## NATURAL RESOURCES CONSERVATION SERVICE CONSERVATION PRACTICE STANDARD

### FORAGE HARVEST MANAGEMENT

(Acre)

CODE 511

#### DEFINITION

The timely cutting and removal of forages from the field as hay, green-chop, or ensilage.

#### PURPOSES

- Optimize the economic yield of forage at the desired quality and quantity
- Promote vigorous plant regrowth
- Maintain stand life for the desired time period
- Maintain desired species composition of the stand
- Use forage plant biomass as a nutrient uptake tool
- Control insects, diseases and weeds
- Maintain and/or improve wildlife habitat

#### CONDITIONS WHERE PRACTICE APPLIES

This practice applies to all land uses where machine harvested forage crops are grown.

#### CRITERIA

##### General criteria applicable to all purposes

Forage will be harvested at a frequency and height that will maintain a desired healthy plant community through its life expectancy. (Use [Table 1 and other references as a guide.](#))

[If wildlife is a major goal of the land manager, avoid harvesting until July to protect nesting birds.](#)

**Stage of Maturity** - Harvest forage at the stage of maturity that provides the desired quality and quantity [and stand persistence.](#)

Delay harvest if prolonged or heavy precipitation is forecast that would seriously damage cut forage.

Where weather conditions make it difficult to harvest the desired quality of forage, use mechanical or chemical conditioners and/or ensile.

[When foliar diseases or insect infestations lower forage quality below what is needed for feed for the intended livestock, before proper harvest stage of maturity is reached, then harvest earlier before excess leaf loss.](#)

[When managing for multiple use objectives other than usage as livestock feed only, harvesting at a later date is acceptable. Feed later harvested forage to livestock class and type with lower nutritional needs and balance the feed ration.](#)

**Moisture Content** - Harvest silage/haylage crops at the ideal moisture range for the type of storage structure(s) being utilized.

Treat direct cut hay crop silage (moisture content > 70%) with chemical preservatives or add dry feed stuffs to avoid fermentation and seepage digestible dry matter losses.

For optimal forage quality, rake, ted, or invert swaths, and bale when hay has sufficient moisture to prevent leaf loss.

Conservation practice standards are reviewed periodically, and updated if needed. To obtain the current version of this standard, contact the Natural Resources Conservation Service.
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Bale at optimum moisture levels to preserve forage quality and quantity. Approximate percent moisture should be as follows:

- Bale field cured hay at 15 to 20 percent moisture.
- Bale forced air dried hay at 20 to 35 percent moisture.
- Rake hay at 30 to 40 percent moisture.
- Ted (mechanically lifting and fluffing hay swaths) or invert swaths when moisture is above 40 percent.

Harvest ensilage at optimum levels to preserve forage quality and quantity. Approximate optimum moisture should be as follows:

- Top unload upright (tower), bunker and horizontal bag silos at 60 to 68 percent moisture.
- Bottom unload upright silos at 45 to 55 percent moisture.
- All corn silage regardless of storage structure at 63 to 68 percent moisture.

Critical components for any silage system (to avoid toxic organisms and chemicals) are to ensure air tight forage containment and proper moisture content.

Making balage has received varied success because it requires high levels of moisture management. Moisture content and the quality of the air tight bale containment are critical.

**Length of Cut** - When harvested for ensilage forage will be chopped to a size that allows adequate packing to produce the anaerobic conditions necessary to ensure the proper ensiling process.

**Contaminants** - Forage shall not contain contaminants at levels injurious to the health of the livestock class and type being fed.

Contaminants are any objectionable matter or toxin that can cause illness, death, or rejection of the offered forage, i.e. poisonous plants, hardware (wire), alkaloid or endophyte containing forages to sensitive livestock species and drought stressed or frosted hydrocyanogenic forages.

When green chopping summer annual grasses containing hydrocyanic acid (HCN), such as sorghum-sudangrass hybrids, delay harvest

until grass is greater than 18 inches tall. Test these forages for HCN if stressed by drought or frost prior to green chopping. When Birdsfoot Trefoil and White Clover are stressed they should be tested before green chopping as well. When ensilage forages exhibit high levels (>2,500 ppm) of nitrates, delay feeding of ensilage for at least six weeks.

#### **Additional criteria to improve or maintain stand life, plant vigor, and forage species mix**

**Stage of Maturity and Harvest Interval** - Cut forage plants at a stage of maturity or harvest interval range that will provide adequate food reserves and/or basal or auxiliary tillers or buds for regrowth and/or reproduction to occur without loss of plant vigor.

Cut reseeding annuals at a stage of maturity and frequency that ensures the production of viable seed or ample carryover of hard seed to maintain desired stand density.

If plants show signs of short-term environmental stress, management will be applied in a manner that ensures continued health and vigor of stand. (i.e., not harvesting the last cutting due to drought stress if plants have not reached their over-wintering heights. Table 3)

Do not harvest alfalfa for at least 30 to 45 days prior to the mean killing frost date.

**Stubble Height** - Cut forage plants at a height that will promote the vigor and health of the desired species. Cutting heights will provide adequate residual leaf area; adequate numbers of terminal, basal, or auxiliary tillers or buds; insulation from extreme heat or cold; and/or unsevered stem bases that store food reserves needed for full, vigorous recovery. (Table 2).

Manipulate timing and cutting heights of harvest to ensure germination and establishment of reseeding or seeded annuals.

### **Additional criteria to use as a nutrient uptake tool**

Employ a harvest regime that utilizes the maximum amount of available or targeted nutrients.

Forages may be planned for harvest that are known to have high uptake rate of soil nutrients such as sorghum-sudangrass taking up large amounts of nitrogen, phosphorous, and potassium from the former grazing sacrifice paddock area.

When producing forages on high fertility/sludge program, test soils for heavy metals and test forages for same if soil tests indicate levels exceeding EPA limitations.

### **Additional criteria to control disease, insect, and weed infestations**

If a foliar disease, insects, or weeds threaten stand survival or production objective, schedule harvest periods as needed to control disease, insect, and weed infestations.

Lessen incidence of disease, insect damage, and weed infestation by managing for desirable plant vigor. This can be done through proper cutting and harvest schedules, maintaining a comprehensive nutrient management plan and focusing on soil health.

### **Additional criteria to improve wildlife habitat values**

Maintain appropriate harvest schedule(s), cover patterns, and plant height to provide suitable habitat for the desired specie(s).

### **Additional criteria on Harvesting, Storage, and Feeding Management**

Choose forages that are suitable for storage (Table 2). In moist climates of New England, storage losses can be significant (50 percent) depending upon the type of bale and the storage method. The highest losses occur from weathering on outdoor bales and soil to bale contact. To preserve nutrients in high quality forage, in door storage may be necessary.

Feeding losses can be high. The method of feeding, type of bale, type of forage, and type of bale feeder all influence the amount of waste in a given feeding operation.

## **CONSIDERATIONS**

When pastures produce forage in excess of livestock demand during high growth rate periods, consider preserving forage quality by machine harvesting a portion of the standing crop. Coordinate this practice with the Prescribed Grazing (528A).

Well-fertilized plants withstand more intense harvest schedules and may produce a higher quantity and quality of forage. Coordinate this practice with the [Vermont NRCS Standard 590 - Nutrient Management](#).

Select cultivars that are suitable for the harvest regime, species mix, and forage quality desired. For specific nutrient uptake, select species that can maximize uptake. See Pasture and Hay Planting (512) and <http://AgGuide.agronomy.psu.edu>.

When insect and disease outbreaks exceed economic thresholds and are uncontrollable by harvest management pesticide applications may be needed. Another option is to select a resistant cultivar when the stand is replaced. See Pest Management (595) and <http://www.css.cornell.edu/extension/CornellGuide>.

To control forage plant diseases, insects, and weeds, clean harvesting equipment after harvest and before storing. [Do not cut forages until dew, rain, or irrigation water on leaves has evaporated.](#)

When [insect and disease outbreaks](#) and weed infestation exceeds the economic threshold and is uncontrollable by [forage](#) harvest management, [alone, weed management should be planned and applied.](#) Pesticide application may be necessary. Another option is to select a resistant cultivar when the stand is replaced. See Vermont Forages home page, <http://uvm.edu>.

Take care not to produce stored forages whose quality is not that needed for optimum performance of the animal being fed. For instance, immature legume forages can be too low in fiber and lead to metabolic disorders in ruminants and an economic loss to the producer due to lowered animal performance.

Direct cut grass and legume silage can create silage leachate (seepage). Consider the collection, storage, and disposal of this leachate as part of an [Agricultural Waste Management System \(AWMS\)](#) or [Comprehensive Nutrient Management Plan \(CNMP\)](#).

In conjunction with harvest options, explore storage and feeding options that will retain acceptable forage quality and minimize digestible dry matter loss.

In regions where rainfall and/or humidity levels cause unacceptable forage quality losses in at least one harvest during the year, consider ensiling the forage to reduce or eliminate field drying time. Other options are: the use of desiccants, preservatives, conditioners, macerating implements, or barn curing techniques to reduce field drying time, greenchopping, or grazing. These techniques can improve the timeliness of harvest and preserve forage quality.

To reduce safety hazard, avoid operating harvesting and hauling equipment on field slopes over 25 percent, particularly on cross slope traffic patterns.

## PLANS AND SPECIFICATIONS

Place the detailed specifications in a site specific job or design sheet, or in the practice narrative in the conservation plan.

These plans and specifications shall be consistent with this standard and shall describe the requirement for applying the practice to achieve its intended purpose.

[The following shall be considered when developing a Forage Harvest Management Plan:](#)

1. [Soil Maps – Outline the area on the conservation plan soil maps or have it on its own map.](#)
2. [Plan Maps – Location of the fields outlined and marked on the conservation plan map or have it on its own map.](#)
3. [Acres planned to be harvested.](#)
4. [Storage method planned.](#)

5. [Operation and Maintenance Plan.](#)
6. [Soil erosion control information – optional.](#)
7. [Forage balance worksheet – option.](#)

## OPERATION AND MAINTENANCE

Before forage harvest, clear fields of debris that could damage machinery, or if ingested by livestock, lead to sickness (for example, hardware disease) or death.

Monitor weather conditions and take action accordingly before and after cutting to optimize forage wilting or curing time to preserve feed quality and prevent forage swaths or windrows from smothering underlying plants.

Inspect and repair harvesting equipment following manufacturer's preventative maintenance procedures.

All shields shall be in place during machine operation to prevent injury or death. Shut off machinery before working on or unplugging moving parts.

Select equipment sizes and capacities that will in a timely and economically feasible manner handle the acreage normally harvested.

Operate all forage harvesting equipment at the optimum settings and speeds to minimize loss of leaves.

Set shear-plate on forage chopper to the proper theoretical cut for the crop being harvested. Keep knives well sharpened. Do not use recutters or screens unless forage moisture levels fall below recommended levels for optimum chopping action.

Regardless of silage/haylage storage method, ensure good compaction and an air-tight seal to exclude oxygen and mold formation.

## REFERENCES

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[NRCS Standard 511 – Forage Harvest Management, USDA – NRCS, Michigan 1/10/01](#)